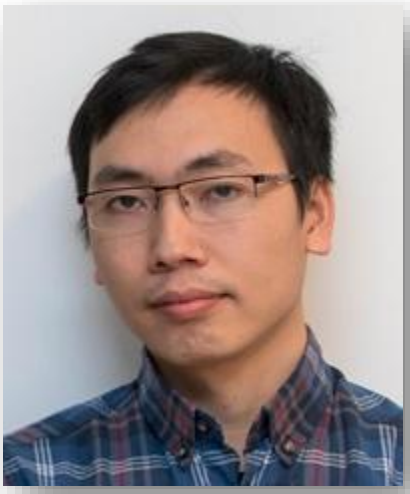
CoCo Seminar Series Spring 2026

Complexity Science Crossing Oceans and Borders - Joint Academic Seminar of CoCo and COLIBRI

Aggregation of Cockroaches with Fast-or-Slow Motion Dichotomy



Dr. Tang Quoc Bao, Associate Professor of Mathematics and Scientific Computing, University of Graz, Austria

Wednesday February 25, 2026 11:15-11:45 am EST

Fully online on Zoom (meeting link available on http://coco.binghamton.edu/)

This talk presents a reaction–diffusion system describing social behaviour of cockroaches. An essential new aspect in this model is that the dispersion behaviour due to overcrowding effect is taken into account as a counterpart to commonly studied aggregation. This consideration leads to an intriguing new phenomenon which has not been observed in the literature for cockroaches. Namely, due to the competition between aggregation towards areas of higher concentration of pheromone and dispersion avoiding overcrowded areas, the cockroaches aggregate more at the transition area of pheromone. Moreover, the fast reaction limit is also considered where the switching rate between active and inactive subpopulations tends to infinity. By utilising improved duality and energy methods, together with the regularisation of heat operator, it is proved that the weak solution of the reaction–diffusion system converges to that of a reaction-cross-diffusion system.

Reference: J. Elias, H. Izuhara, M. Mimura, Bao Q. Tang. An aggregation model of cockroaches with fast-or-slow motion dichotomy. Journal of Mathematical Biology. (2022) 85:28

Tang Quoc Bao is an Associate Professor in the Department of Mathematics and Scientific Computing at the University of Graz, Austria. He obtained his Ph.D. and Habilitation both from the University of Graz. His research topics include dynamical systems, convergence to equilibrium, chemical reaction networks, reaction diffusion systems, and stabilization.

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